Phycological Research 2014; **62:** 322 doi: 10.1111/pre.12076

Book Review

Marine Benthic Dinoflagellates – Unveiling Their Worldwide Biodiversity.

Mona Hoppenrath, Shauna A. Murray, Nicolas Chomérat and Takeo Horiguchi 2014. Kleine Senckenberg-Reihe, Band 54, Schweizerbart, Stuttgart, Germany, 276 pp., 93 Figs (more than 200 color images, approximately 150 scanning electron micrographs, and more than 250 drawings), 8 Tables, in English.

ISBN 978-3-510-61402-8, paperback, 19.90 Euro.

The book 'Marine benthic dinoflagellates – unveiling their worldwide biodiversity' has been released recently at a low price and covers almost all benthic dinoflagellate taxa described so far, with illustrations using light and electron microscopies for discriminating similar species. In addition to the comprehensive taxonomic information, the phylogeny, ecology, and toxicity of certain benthic species are also provided in each chapter. This is the first book compiling the present knowledge of only the marine benthic dinoflagellates, including athecate and thecate species.

Benthic dinoflagellates are a group of dinoflagellates, inhabiting the interstitial spaces of sand grains or on the surfaces of seaweeds and seagrasses, etc. The bloom-forming tide pool dinoflagellates are also treated as benthic dinoflagellates in this book. The benthic dinoflagellates comprise several toxic taxa responsible for ciguatera fish poisoning, which affects humans via the consumption of tropical reef fish, and their wide distribution has recently been revealed, and the importance of unambiguous species identification of benthic dinoflagellates is now recognized. However, recent molecular works and ultrastructural observations demonstrate the detailed phylogenetic and morphological differences in each dinoflagellate, resulting in the establishment of many new taxa and making species identification more difficult. This is also the case with benthic dinoflagellates, and like other algal taxa an extensive literature search is required not only for taxonomy but also for identification applied to other fields of research related to benthic dinoflagellates. Among the 45 genera and 182 species (including varieties) mentioned in this book (chapter III), 14 genera and 73 species were newly described after the year 2000. This comprehensive information therefore undoubtedly contributes to works on benthic dinoflagellate taxonomy, physiology and shellfish poisoning.

The book has seven chapters. Chapter I ('Introduction') includes a brief taxonomic background and the thecal plate arrangements of dinoflagellates. Chapter II ('Materials & Methods') is illustrated with scenic photos such as sandy beaches and tide pools, from where some benthic dinoflagellates were collected for the original descriptions. Chapter III ('Taxonomy') is the main chapter of the book with 170 pages, and contains the description of morphological features of benthic dinoflagellates in alphabetical order. Since the authors are leading taxonomists of benthic dinoflagellates, the morphological information described in this chapter is reliable for species identification. Among the 45 dinoflagellate genera included, 16 genera were originally described or are redescribed by the authors of this book; *Amphidiniella* Horiguchi, *Ankistrodinium* Hoppenrath, Murray, Sparmann *et* Leander, *Apicoporus* Sparmann, Leander *et* Hoppenrath, *Bispinodinium* Yamada *et* Horiguchi, *Cabra* Murray *et* Patterson, *emend*. Chomérat, Couté *et* Nézan, *Galeidinium* Tamura *et* Horiguchi, *Halostylodinium* Horiguchi *et* Yoshizawa-Ebata, *Pileidinium* Tamura *et* Horiguchi, *Pseudothecadinium* Hoppenrath *et* Selina, *Pyramidodinium* Horiguchi *et* Sukigara, *Rhinodinium* Murray, Hoppenrath, Yoshimatsu, Toriumi *et* Larsen, *Sabulodinium* (Saunders *et* Dodge) *emend*. Hoppenrath *et al*., *Spiniferodinium* Horiguchi *et* Chihara, *Testudodinium* Horiguchi, Katsumata, Tamura *et* A. Yamaguchi, *Togula* Flø Jørgensen, Murray *et* Daugbjerg, *Vulcanodinium* Nézan *et* Chomérat. Many genera and species are therefore well described by these authors, with beautiful color photomicrographs. In this chapter, a new species *Amphidiniopsis yoshimatsui* Hoppenrath, and a new combination *Bysmatrum gregarium* (Lombard *et* Capon) Horiguchi *et* Hoppenrath, are also proposed. In Chapter IV ('Phylogeny and systematics') the phylogenetic relationships of some selected benthic taxa were introduced, and the polyphyly of the order Phytodiniales was demonstrated in a phylogenetic tree. In Chapter V ('Biogeography') the similarities of benthic dinoflagellate species composition were compared using the floristic data from a number of locations; Germany, Canada, Italy, France, Australia, Japan, Malaysia and Kuwait, including unpublished data. In Chapter VI ('Ecology') the authors mention several characteristics of benthic dinoflagellates, for example, attachment, life cycle, vertical migration and blooming. Chapter VII ('Toxins of benthic dinoflagellates and benthic harmful algal blooms') contains information on the toxic compounds found in *Amphidinium*, *Gambierdiscus*, *Ostreopsis*, *Prorocentrum* and *Vulcanodinium* with a list compiled for each species. Many of these benthic dinoflagellate species and genera are responsible for fish poisoning and profiles of the bioactive compounds were recently analyzed for each species, some of which were newly discovered. The comprehensive information on taxonomy and toxins will greatly contribute to studies on benthic harmful algae.

Mitsunori Iwataki
Asian Natural Environmental Science Center,
The University of Tokyo